Artificial Intelligence in Communication Network Management

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Abstract. This paper is devoted to discussing the application of artificial intelligence in the management of communication networks. It analyzes the unique advantages and difficulties encountered in the development of artificial intelligence and the effective application of artificial intelligence in communication network management. One of the inevitable trends of the development of contemporary science and technology is the comprehensive popularization of artificial intelligence, artificial intelligence technology has penetrated everyone's life, bringing a lot of convenience and changes to human life. Its unique advantages can effectively alleviate the lack of information processing capacity at this stage, improve work efficiency and reduce errors. But the lack of unified management standards and innovation ability is an important reason for the slow development of artificial intelligence. The development of artificial intelligence is a process of both opportunities and challenges. We need to enjoy the convenience and changes brought by AI while also focusing on dealing with the challenges and problems brought by AI. The application of artificial intelligence in communication network management can make up for the loopholes and deficiencies in the communication network, provide better services for human beings, and promote the development of society in a better direction.

Keywords: Artificial intelligence, Communication network management, Application.

1 Introduction

In today's big data era, artificial intelligence makes a big difference and efficiently helps communication network application scenarios. the algorithms and arithmetic power of artificial intelligence play a greater value in network management. the application of AI in the field of communication network management is blossoming. Artificial intelligence has advantages that cannot be compared with general computers, such as high data accuracy, high efficiency and low error rate. In the era of new robotics, machines are not only expected to perform repetitive routine tasks in predictable environments, but are also being deployed to assist humans in uncontrolled environments [1]. However, AI today is still an assistive tool that lacks trust and communication with humans and is not innovative enough to be fully applicable in the field of communication network management. From a technical

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point of view, AI subverts the conventional way of working and provides humans with a better perspective on problem solving. Artificial Intelligence is a tool that will definitely be used in human life, and the wide application of Artificial Intelligence helps to improve network security and the quality of communication services. Therefore, this paper discusses the application of AI in communication network management from three aspects, namely advantages, dilemmas and effective applications. In the future, so that artificial intelligence driven by good models can be close to the reality of the application, so that human beings can actually get effective help.

2 Characteristics of Artificial Intelligence

2.1 The Advantages of Artificial Intelligence

Artificial Intelligence is one of the fastest growing technologies in the world and its market size is expected to reach $270 billion by 2027, according to reports. In the future it is projected to reach around $15 trillion. The deep integration of artificial intelligence and the real economy is the charge of the AI industry and the wind vane for the upgrading of traditional industries. Artificial intelligence is undoubtedly an important part of the next global technological development.

Artificial intelligence can not only reduce the problems of low manual efficiency and error-prone, but also has the advantages of imitating human decision-making, self-learning and avoiding repeated errors. Specifically embodied in three points, first, high data accuracy and high efficiency of information transfer within the system. In the daily work of human beings, there are many repetitive tasks. Using artificial intelligence, people can efficiently automate these repetitive tasks, and even eliminate "boring" tasks for humans, freeing them to utilize their increasing creativity. For example, in a bank, it is common to see many documents verified in order to obtain a loan, which is a repetitive task for the bank owner. If automated using AI, the process of validating documents will be greatly accelerated and both customers and bank staff will benefit. Secondly, the transparency of information allows for reasoning and calculations based on the latest situation, allowing for timely responses and reducing the time spent on operations. Using AI in conjunction with other technologies will allow machines to make decisions and take action faster than humans. While making decisions, humans analyze many factors emotionally and practically, but AI-powered machines work the way they are programmed to and deliver better results in a faster manner. Thirdly, it saves human resources, reduces costs and easily solves problems that humans cannot do. Artificial Intelligence can even help identify the tiniest anomalies in medical images that may have been missed by human radiologists [2]. So applying AI to communications network management has the same effect, recognizing anomalies that are overlooked by human engineers. The term human error comes from the fact that humans cannot avoid making mistakes. However, if the program is set up correctly, then the AI will not make these mistakes. Artificial intelligence makes decisions based on information previously gathered through algorithms, thus reducing errors and increasing accuracy. The inability to predict what

decisions AI will make is both an advantage and a disadvantage. This is because the system may make decisions that do not meet human-defined goals. The problem is exacerbated when the AI system is a goal-oriented system or a system that interacts with the real-world environment.

As mentioned above, AI has unique advantages and can play a key role in the field of communication network management, but it encounters some difficulties that hinder its development. Overall, AI has many advantages but still has shortcomings, in order to better utilize the advantages of AI, the next article will discuss some of the dilemmas it faces today, and get a comprehensive understanding of the current situation of AI in the field of communication management.

2.2 Problems Encountered in the Development of Artificial Intelligence

Lack of uniform regulatory standards across the industry. Artificial Intelligence is an emerging industry in the 21st century, with no clear management standards and industry rules, not to mention a mature system and industry chain. Several studies have pointed out the negative consequences of using AI. First, rising unemployment. Second, the possibility of manipulating public opinion. Third, the disruption of private life [3]. The lack of unified management standards leads to a mixed industry and slow development of artificial intelligence. More consideration needs to be given to the management of communication networks, and the implementation of AI poses cybersecurity risks. Artificial intelligence requires a lot of data for training, which means that personal data must be captured. And too much exposure of personal data can lead to misuse by others, which can further exacerbate problems such as data breaches. Uniform standards are needed to ensure data privacy and security, and transparent data collection policies can also help alleviate concerns related to AI. The lack of transparency and interpretability reduces the trust and verifiability of decisions made by AI systems [4]. Measurable morality and fairness of machines is difficult to design and communicate, and it is difficult to teach that AI is right unless engineers provide the concept. AI has no human moral and ethical standards, and failure to properly regulate AI can lead to many problems. In China, for example, people do not know much about AI, let alone understand how it works. AI itself lacks moral and emotional standards, and gaining the trust of users and even regulators is very difficult, but it is the way to go. In addition, there is often a “hidden layer” between the data input and the answer to its output, which is called a “black box”, which is difficult to determine whether AI is wrong [4]. Especially if individual erroneous decisions can pose a threat to human life and health, relying on a data-driven system whose difficulty to understand may not be a good choice.

Overall innovation capability is poor. Artificial Intelligence systems are machine-based systems that do not have the ability to think independently and can only respond to given human-defined requirements such as prediction, judgment, and decision-making [5]. As far as the current level of technology is concerned, the ability to constantly innovate does not belong to artificial intelligence, and the fields and industries it applies to are mostly repetitive work. AI is predicted to replace the profession of teacher, but it needs to mimic human behavior, and engineers need to

build models for AI. Although it can be explored through continuous experimentation, without human thinking and behavior as a reference, artificial intelligence still cannot innovate and can only work according to set commands. In terms of narrative ability, artificial intelligence will also be lacking, and its expression mode integrates People's Daily conversations. For some context and tone changes, artificial intelligence is still unable to achieve. That's why AI can usually only perform tasks that have already been given, making it difficult to think independently and create new ideas. Although AIs have achieved amazing performance on specific tasks, they are still unable to be as versatile and flexible as humans with generalized intelligence in complex and variable environments. This means that AI systems are difficult to migrate and apply in different domains, limiting their application in a wider range of fields. The advantages and disadvantages of AI are listed in Table 1.

Table 1. Advantages and Disadvantages of AI

	advantage	weak point
Artificial Intelligence	High accuracy	Lack of a unified management standards
	Save cost and time	No creativity
	Faster decision making	Unemployment rises
	Reduce human error	Security issues
	High commercial value	Lack of emotion

Regarding the effective application of AI in communication network management, there are at least two aspects worth studying and exploring: network security and communication service quality improvement. Therefore, the next part of this paper focuses on the key role and impact played by AI in these two aspects.

3 The Application of Artificial Intelligence in Communication Network Management

3.1 Network Security

Network security has always been the most concerned of human beings and the most important issue in the management of communication networks. The main reason is that once a user's personal information is maliciously stolen, it means that the user's information is leaked. When the situation is serious, it will also make users face very serious economic losses. With the hacking of Singapore's health records database and the potential problem of private companies gaining access to such personal data, there are concerns about security [6]. In order to cope with the challenge of frequent network security problems, a method of applying artificial intelligence techniques to secure communication in computer networks is proposed [7].

More than half of companies say that only AI can detect data security threats. Most of them are telecom communications companies. Most organizations believe that AI can reduce the cost and time required to detect dangers. Approximately 300 billion emails are sent every day. Artificial intelligence detects at least half of the data as spam.

Solving cybercrime requires significant research in cybersecurity analysis, cyberthreat intelligence and digital forensics [8]. Artificial Intelligence technology can well protect network security and provide rapid tracking and reporting of cyberattacks. The application of AI macro modeling in mobile communication networks heralds a lowering of the threshold and an increase in efficiency. This requires the creation of a data information base and the rational optimization of security coding, which in turn further improves the stability and security of the computer network system. The anti-fraud capability is then continuously improved through persistent training of machine learning algorithms.AI assists in network security by monitoring traffic, identifying threats and attacks, and taking defensive measures. It can also be applied to user authentication, fraud detection and data encryption to safeguard communication privacy and data security. In this way, AI can use computer systems to quickly improve the quality and efficiency of work, accelerate the speed of response, so that the function of the intelligent system to achieve a certain degree of optimization and improvement, thus significantly improving the security in the communication network, providing strong support for the sustainable and healthy development of the field.

3.2 Communication Service Quality has been Improved

Transferring the information contained in a signal from the starting point to the end point through different communication techniques is the principle of communication. The quality of communication is measured by how accurately the information is transmitted to the receiving end. In the early days of mobile development, communication services were dominated by simple voice processing. Later, as mobile communication networks become more and more complex and the communication service ecosystem becomes more and more diversified, the communication network infrastructure and service systems need to face more and more complex scenarios. These complex scenarios rely on traditional manual rules predefined and executed processing and management capabilities can no longer meet the demand. Notably, trillions of dollars of service transactions occur every day, making it urgent to develop fully automated intelligent recommendation systems to match the right services to customers [9]. AI can break down time and space constraints, redistribute resources on a larger scale, and truly enable tiered services. As a result, automated and intelligent systems and means have become an increasingly prominent demand in communication systems.

Machine learning and artificial intelligence enable organizations to better utilize the data they already have and find solutions to difficult problems, both of which allow them to scale their business in a timely and cost-effective manner [10]. In this context, AI, with its superior data analysis and information extraction capabilities, can

not only help enterprises turn data into benefits, but also solve the efficiency and capacity problems faced by communication networks and intelligently provide big data and information services. For communications companies, AI can streamline the way they communicate with their customers. It takes fewer resources to understand customers' needs and enable effective customer relationship management. In customer relationship management, AI aims to do more than just collect data; it has the potential to increase sales and keep existing customers happy [10]. Artificial intelligence improves the service quality and performance of communication networks through continuous learning, analysis and prediction, so that users can use the communication service system more smoothly. The effective combination of communication technology and artificial intelligence improves both the processing speed of information and data and the efficiency of work, and to a certain extent promotes the stable development of the communication industry.

4 Conclusion

This paper details the advantages, dilemmas and effective applications of artificial intelligence in communication network management. The use of artificial intelligence in the field of communication network management can improve efficiency, save labor, and further improve the upper limit of network management. However, there are also shortcomings such as inconsistent management standards and poor innovation ability, which need to be improved step by step. Artificial intelligence is not only essential in life, but also can be effectively applied in communication network management. For examples, network security and automated network management. Cybersecurity is a major concern for people, and the improvement in the quality of communication services has effectively helped human life. These effective applications reveal the powerful potential of AI, which brings immeasurable benefits to the field of communication network management. Therefore, artificial intelligence technology is a key project for the development of every country, and a more in-depth study of artificial intelligence will enable it to play a greater role in communication network management, as well as provide better services for human beings and create value for the whole society.

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